IS PERCEPTION OF FINANCIAL HOUSEHOLD WELL-BEING ASSOCIATED WITH COGNITIVE CAPACITY?

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To the Faculty of Washington State University:

The members of the Committee appointed to examine the dissertation/thesis of ADITI ANUP SURVE find it satisfactory and recommend that it be accepted.

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Abstract

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This paper seeks to answer the questions of how perceptions of household income affect cognitive capacity. The objective of this paper is to examine if perception of household well-being is a determinant of cognitive capacity. This project does not provide information on how the relationship between cognitive capacity and perception of household well-being contribute to economic decision making. It only seeks to establish if a relationship between cognition and perception of household well-being exists.

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Dedication

To my parents,

Anup and Nandini

CHAPTER ONE: INTRODUCTION

Eradication of poverty is a global priority. It was identified as the first of the Millennium Development Goals. According to the United Nation's World Social Summit it is important to target the foundation of poverty and provide the poor with not only income and productive resources but also basic education and training to ensure sustainable livelihood[1] . Despite continued efforts, poverty continues to exist. Individuals living on less than US$1.90 per day are termed as extremely poor by the World Bank[2]. The existence of persistent poverty can be explained by the self-reinforcing behavior of poor people (Barrett and Carter 2006, Mullainathan and Shafir, 2013). Poor people are unable to manage their finances systematically due to credit constraints, access barriers to formal credit; often rely on local moneylenders and face high costs (Blank and Barr, 2009). Additionally, the poor may also face sleep deprivation and engage in substance abuse (Schilbach, 2018)

Scarcity of resources can lower cognitive capacity. Traditionally in economics, scarcity is defined as having limitless wants but only limited resources to meet those wants. The perception of scarcity places a burden on cognitive capacity (Mullainathan and Shafir, 2013). Research shows financial stress can tax cognitive capacity (Mani et al., 2013). Therefore, poverty may, not only involve meeting everyday expenses with less money, also require the poor to do so with reduced cognitive capacity. Mani and colleagues (2013) argue that it is not the availability of time, health or nature of the work but poverty itself that hinders cognitive ability.

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[1] "Poverty Eradication | Poverty Eradication." *United Nations*, United Nations, www.un.org/development/desa/socialperspectiveondevelopment/issues/poverty-eradication.html.

[2] "New Data Show 1.4 Billion Live On Less Than US$1.25 A Day, But Progress Against Poverty Remains Strong." *World Bank*, 16 Sept. 2008, www.worldbank.org/en/news/press-release/2008/09/16/new-data-show-14-billion-live-less-us125-day-progress-against-poverty-remains-strong.

Perceptions may be forward and retrospective in nature. Therefore, perceptions of resource scarcity may be informed by experiences in the recent past, as well as perceptions or expectations of future resource availability. A change in perceived well-being during the recent past is expected to have a greater effect on cognitive capacity, compared to an equal change in forward looking perceptions (Katona, 1975). A range of factors may contribute to this. These include: loss aversion (Kahneman and Tversky, 1992), changes in the future are uncertain, and people are typically poor at estimating future returns (Laibson, 1997). Perceptions of financial well-being may play an important role in contributing to financial stress.

CHAPTER TWO: RESEARCH QUESTION AND HYPOTHESIS

The research question of my project is: do perceptions of household financial well-being have an association with cognitive capacity. The null hypothesis (H_0) is that there is no association between household financial well-being and cognitive capacity. The alternate hypothesis (H_A) is that there is an association between household financial well-being and cognitive capacity. Relevant literature suggests that a negative association between perceptions of household financial well-being and cognitive capacity exists. The perception that your household financial well-being is worse than prior expectations, this leads to increased stress and decreased cognitive capacity.

CHAPTER THREE: LITERATURE REVIEW

3.1. Cognitive Capacity

Cognitive capacity plays an important role in decision making. Cognitive functions can be broadly categorized into attention, inhibitory control, memory and higher order cognitive functions. Each of the categories have several subcomponents. Intelligence is classically dichotomous – fluid (gf) and crystalized (gc) (Cattell 1963). Fluid intelligence involves abstract reasoning and thinking logically to solve problems. Crystalized intelligence comprises of facts and knowledge that people acquire over lifetime. A form of short-term memory is Working Memory Capacity, which involves temporary storing and manipulating information.

In the economics literature, cognition is conceptualized as relating to inhibition (Flanker Task), reflective thought (Cognitive Reflection Test) and executive control (numerical Stroop task) (Carvalho, Meer and Wang, 2016). Flanker task is used to measure inhibitory control as it requires participants to focus on central stimuli at cost of ignoring other distracting stimuli (Eriksen and Eriksen, 1974). Mani and colleagues (2013) used Raven's Progressive Matrices to measure fluid intelligence, numerical Stroop task, and spatial compatibility task to measure the speed and accuracy of response.

The relationship between fluid intelligence and working memory is debatable. According to Kyllonen and Christal (1990) there is a high correlation between fluid intelligence and working memory. Through the use of experiments, they found correlations between these two measures of cognition ranging between 0.80 to 0.90. More recently, a meta-analysis conducted by Ackerman and colleagues (2005), found that on average working memory tests correlated 0.364 with intelligence. Chuderski (2012) argues the degree of variation in fluid reasoning explained

by working memory depends on time. The variation in fluid intelligence explained by working memory decreases when time allotted to complete tasks increases.

3.2. Poverty And Cognitive Capacity

There is much debate regarding definitions of poverty. Absolute poverty is when people lack basic necessities for survival and relative poverty is when income of individuals is sufficiently less compared to the general standard of living (Ludi, 2007). The first definition of poverty was developed in terms of nutritional intake by Rowntree in 1901(Ludi , 2007). There is a close link between unemployment and poverty (Dasgupta and Ray, 1968). Frequently, when the absolute poor get jobs, their wages are not enough to come out of poverty due to the low-skilled nature of such work (Dasgupta and Ray, 1968). Malnutrition due to poverty can impact a person physically as well as psychologically in the form of depression, reducing motivation and lowering intellectual capacity (Read, 1977).

There is hypothesized a close relationship between poverty and cognitive capacity. Living in poverty can creates obstacles for those aiming to experience higher living standards (Mani et al. 2013). The effect of living in poverty is hypothesized to leave very little reserve mental energy. This can make it difficult for an individual to focus on other tasks effectively. When cognitive capacity reduces, due to poverty, there is a direct impact on consumption and savings patterns, risk preferences, wealth and earnings. If the effects of poverty are large enough then it can eventually lead to poverty trap (Dean, Schilbach and Schofield, 2017).

3.3. Risk Preferences And Decision Making

One possible mechanism explaining how cognitive capacity is related to decision making is through risk preferences. Risk preferences are peoples' attitudes towards risk (Wen, He and Chen, 2014). The reduction in cognitive capacity created by stress can alter risk preferences and

have an impact on economic decision making. The magnitude of negative income shocks can impact risk taking behavior (Bernile et al., 2017). Poverty induced stress may also lead to short sighted and risk-averse decision making (Haushofer and Fehr, 2014). A study conducted in Vietnam found that changes in risk preferences may be due to negative income shocks (Dalton, Nhung and Ruschenpohler, 2019). In this study, small business retailers were presented with a series of hypothetical financial scenarios. Retailers were randomly assigned into treatment (hard scenarios) and control groups (easy scenarios). Results showed that retailers in treatment group were less risk averse compared to those in the control group. This behavior was strongest for smaller shop owners and those who were not exposed to shocks involving large income volatility. Thus, stress is hypothesized as a pathway from negative income shocks to reduced risk tolerance. The stress felt by participants in treatment groups was more intense than control group which reduced cognitive capacity leading them to make less risk averse decisions.

3.4. Scarcity Hypothesis

Low-income countries are often marked by unemployment, poor healthcare and education, malnutrition, high birth rates, high infant mortality rates (Revelle, 1966). Often the majority of the population lacks access to financial resources required to maintain a basic standard of living. Sources of earnings for the rural poor comes from the primary sector (Revelle, 1966). These earnings may be seasonal (Mani et al., 2013), irregular (Jha et al., 2009) and uncertain because of natural unforeseen contingencies (e.g. climate shocks like drought, floods, cyclones, typhoons can ruin crops and kill livestock) (Carter et al., 2007). Thus, the poor in these contexts are constantly engaged in making tradeoffs with limited resources. These monetary concerns can induce stress, be a source of distractions eventually lowering the capacity to focus on other problems effectively (Mullainathan and Shafir, 2013). Negative stress is a state in which the

person fails to cope or adapt to return to physical or psychological homeostasis (Carstens and Moberg, 2000). Mani and colleagues (2013) provide empirical evidence of the effect of scarcity on cognitive capacity. Through these studies, researchers provide empirical evidence and a plausible explanation for differences in cognitive capacities of individuals when they have scarce earnings. Financial concerns of farmers were found to induce more stress during the pre-harvest period compared to post harvest. Farmers were also found to perform poorly on Raven's Progressive Matrices in the pre-harvest period compared to post harvest. Thus, the cognitive capacity was significantly lower when there was scarcity of income. Thus, farmers perceive higher levels of scarcity before harvest which triggers stress and reduces cognitive capacity.

When financial earnings are scarce, the needs of poor people become more urgent. Poor people get consumed with today's needs and worries to a point where they completely seem to neglect future needs, which can be more or equally important (Mullainathan and Shafir, 2013). This behavior can be responsible for increasing and reinforcing poverty (Barrett and Carter 2006, Shafir and Mullainathan, 2013). An important example can be explained by the borrowing habits of the poor people. In order to meet their present needs, poor people are more likely to borrow loans which have extremely high interest rates (Chen, 2004). To take care of their present financial worries, the poor may not consider the costs of repaying the loan. Thus scarcity, here, draws attention on the benefits of the loan to a point where high future costs are ignored. Scarcity of money triggers the need to borrow among poor people without considering if the benefits are going to outweigh the costs (Bair, 2004).

The core mechanism of the scarcity thesis is having less draws more attention on some problems, while completely disregarding others (Shah and Mullainathan, 2012). Shah and Mullainathan (2012) conducted a series of lab experiments to explain how scarcity can reduce cognitive

capacity and engage poor people in behaviors that can reinforce poverty. These experiments were conducted in lab to avoid complexities from the world that guide behavior. The authors observed that poor participants spent more time at each task compared to the rich participants. By controlling for the ability to borrow, the results suggest that the poor perform better when they were unable to borrow. Moreover, there was a positive relationship between amount of borrowing and time spent on each task among the poor participants. Excessive focus on a particular round resulted in excessive borrowing for that round, without having a consideration for future. Thus, the conclusion that scarcity negatively affected cognitive capacity and resulted in lower performance among the poor participants.

CHAPTER FOUR: DATA

The data for this study is obtained from a repeat cross-sectional survey carried out in central Kenya. The sample size contains approximately 400 individuals who were surveyed between one and three times over a 17-month period. The sample population is from Samburu county, Kenya. The capital of Samburu, Maralal, is situated 350 kms north of Nairobi. The environment is classified as semi-arid. The primary source of income of the sampled individuals comes from growing crops and raising livestock. The headcount poverty measure of Samburu was 75.8% as per data collected between September 2015 and August 2016 and the poverty threshold 3252 shillings (Government of Kenya 2018). Research design and associated tools used in the study were approved by the Washington State University Institutional Review Board (#16207) and the Kenyatta National Hospital-University of Nairobi Ethics and Research Committee (P613-10/2017).

The data was collected when the county was struck by a severe drought. Samburu typically receives rainfall twice a year- in March and April, and, October and November. Round 1 was conducted in the middle of the October-November rains in 2017, round 2 was before the March-April rains in 2018, and Round 3 was before the October-November rain in 2018. The difference between actual rainfall and long-term average rainfall during the months prior and after round 1 was 41 centimeters (October) and -20 cm (November), round 2 was -15 cm (February) and 110 cm (March), and round 3 was -4 cm (August) and -26 cm (September) (Government of Kenya, 2018). The following graph shows the long-term average rainfall and the difference between actual and long-term average rainfall over 17 months. This also shows the intensity of the drought in Samburu.

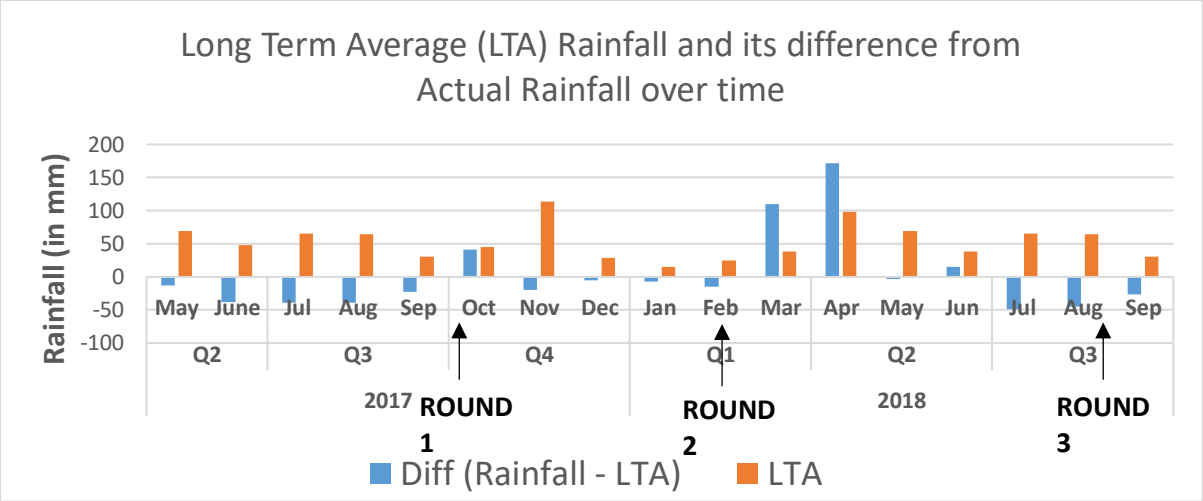

Figure 1: Long Term Average (LTA) Rainfall and its difference from Actual Rainfall over time

A total of 168 participants (43%) completed one round of surveys - 94 in round 1 and 74 in round 2 - while 156 participants (39%) completed two survey rounds - 51 in rounds 1 and 2, 77 in rounds 2 and 3, and 28 in rounds 1 and 3. The number of respondents who completed three rounds was 77 (19%).

The measure of cognitive capacity used in this project is fluid intelligence. The short-form standard adult Raven's Progressive Matrices were used to measure fluid intelligence. Raven's Progressive Matrices has been successfully used to study the Flynn effect among children in rural Kenya (Daley et al., 2003). This was a first study conducted to study Flynn effect in a low-income country using Raven's Progressive Matrices. This study involved answering 60 tasks on the test which is the standard length of RPM test.

A short-from of the standard adult version was used, which included 20 tasks instead of the standard 60. The Raven's Progressive Matrices was used because the test does not require participants to have a minimum level of literacy. The summary statistics for RPM are found to be similar in magnitude with current study which validates the surveys. The ratio of mean RPM to

tasks in study conducted to study Flynn effect was 12.82 /60 (Daley et al., 2003) which is very close to current study 5.67/20 (Table 1).

Non-poor, ultra-poor and regular poor are binary variables measuring degrees of poverty. Non-poor accounts for respondents with monthly income above 3252 shillings per person. Regular-poor accounts for respondents with monthly income between 1000 and 3252 shillings. Remaining respondents belong to ultra-poor with monthly income less than 1000 shillings. Table 1 shows the summary statistics of the variables of interest.

Age is measured in years. The illiterate measure is a binary variable measuring the proportion of respondents who self-reported as having no schooling. The variable 'Incomee' is a binary variable that measures whether respondents perceived their household finances were worse than expected. The 'stress' variable measures the loss of livestock relative to the current herd. It controls for loss of livestock at household level and provides a relative measure of the intensity of the loss. Normalized Difference Vegetation Index (NDVI) is an aggregate measure of the amount of vegetation using infrared satellite imaging. The term 'stress_veg' is used to represent NDVI. This measure is at the village level. The Food and Agriculture Organization standardized measure of livestock units is used to aggregate the number of cattle, goats, camels and oxen owned by each household.

Table 1 Descriptive Statistics

Variable	# of Obs.	Mean	Standard deviation	Minimum	Maximum
Raven's Progressive Matrices (RPM)	709	5.67	2.74	0	13
Non poor	707	0.16	0.37	0	1
Ultra poor	707	0.51	0.50	0	1
Regular poor	707	0.31	0.46	0	1
Age (years)	712	42.61	14.53	16	82
Illiterate	708	0.67	0.47	0	1
Perception of past Income (Incomee)	704	0.90	0.29	0	1
Percentage of livestock died relative to current herd(Stress)	708	70.84	78.16	-899.99	100
Normalized Difference Vegetation Index (Stress_veg)	708	134.75	13.98	114.5	164.13
Standardized livestock units (FAO)	713	4.81	5.86	0	56.30

Figure 2 presents a series of boxplots showing the relationship between the variables RPM and incomee. The value 1 corresponds to respondents who perceived their household finances were worse than expected, while 0 represents respondents who perceived their household finances were

as expected or better than expected. In round 2 the RPM interquartile range is much smaller for 0 compared to 1.

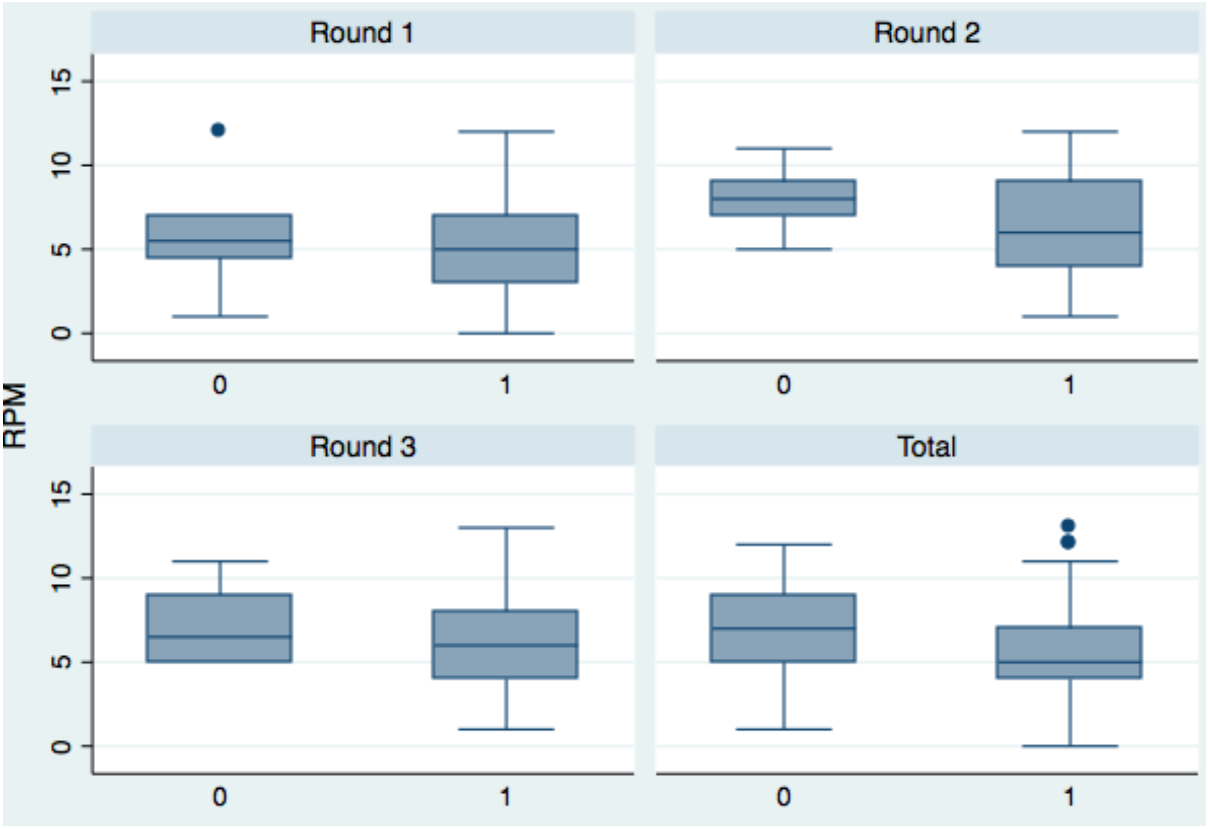

Figure 2: Boxplot showing the relationship between RPM and perception of past income

Figure 3 presents a series of boxplots demonstrating the relationship between cognitive capacity across three income categories. The value 0 represents people who are above the poverty line, while 1 corresponds to ultra-poor people with household income less than 1000 shillings and 2 regular-poor people with monthly household income between 1000 and 3252 shillings. From the interquartile range there appears no difference between 0,1 and 2.

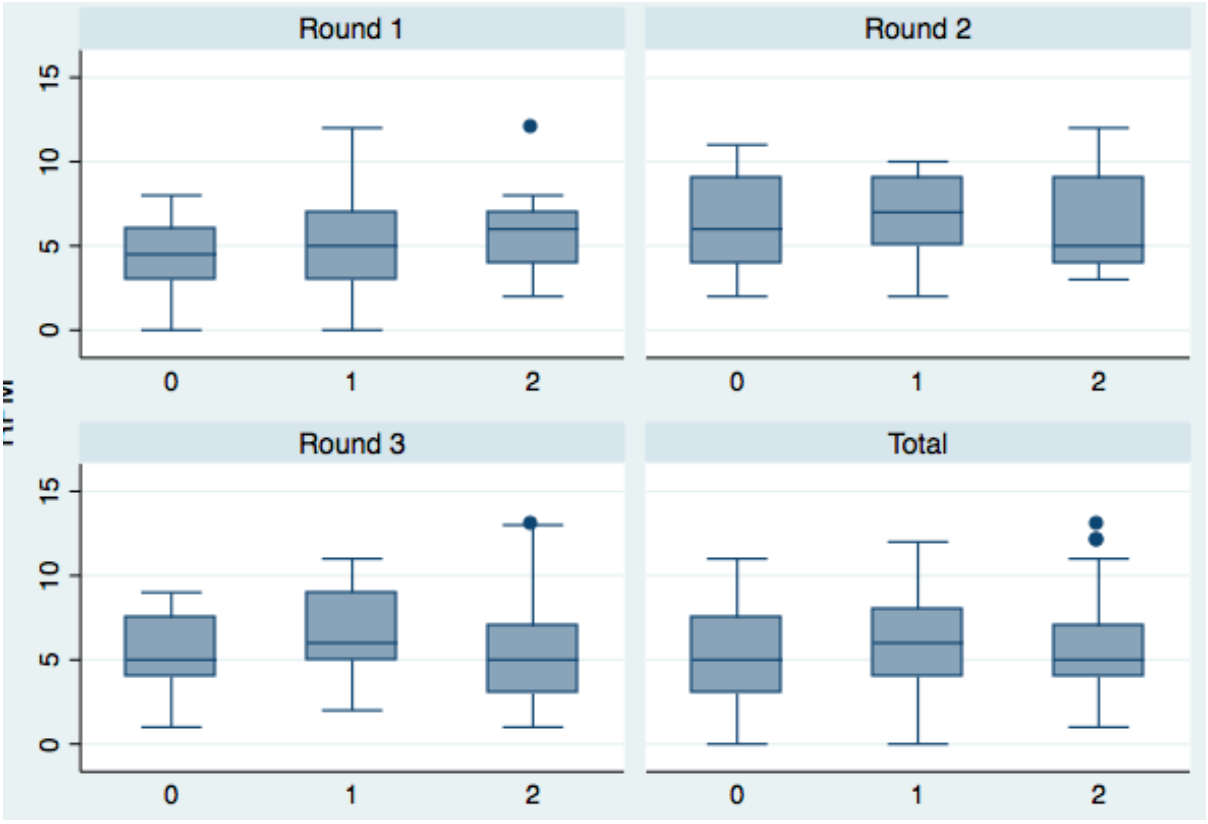

Figure 3: Boxplot showing the relationship between RPM and three income categories

CHAPTER FIVE: METHODOLOGY

The survey rounds coincide with reduced rainfall. Because the sampled individuals belong to agro-pastoral communities, lack of rainfall has a direct impact on their earnings and becomes a significant source of stress.

The following Ordinary Least Square (OLS) regression model is applied to the pooled data.

$$RPM = \beta_0 + \beta_1 age + \beta_2 illiteracy + \beta_3 incomee + \beta_4 stress + \beta_5 stress_{veg} + \beta_6 fao + \beta_7 ultra\ poor + \beta_8 regular\ poor + \epsilon$$

The relationship between age and to cognitive capacity is expected negative. Developmental psychology indicates that fluid intelligence decreases, on average, past the age of 25 (Cattell, 1963).

The variable incomee could be endogenous. A variable is said to be endogenous if it is correlated with the error term. There is a potential bidirectional relationship between cognitive capacity and perception. On one hand, if an individual's perception of their financial well-being is worse than he expected then it can reduce cognition due to stress. On the other hand, if a person has reduced cognition due to stress, then the person could perceive his future household financial well-being worse.

An instrument variable approach may be used to correct for biased parameter estimates due to endogeneity. An instrument variable helps to fix endogeneity because of the two characteristics it exhibits- instrument exogeneity and instrument relevance. As per instrument exogeneity, the instrument variable should have no partial effect on dependent variable and according to instrument relevance, the instrument variable must be correlated with the endogenous explanatory variable (Wooldridge, 2012).

The use of lagged right-hand side variables may be used as an instrument. The correlation between the dependent variable and lagged variable reduces the further back a lags go (Wang and Bellemare, 2019).

The use of cross-sectional data and the OLS estimator does not provide changes in scores of cognitive capacities of sampled individuals. To measure the changes in the association between cognitive capacity and its determinants, the Fixed Effects estimator is appropriate. Fixed Effects help to obtain more accurate coefficients by controlling for time invariant variables. The structure of fixed effects model is given by equation (3).

Consider the following model with one independent variable. The subscripts *i* denotes individuals and *t* time periods.

$$y_{it} = \beta_1(x_{it}) + a_i + u_{it} \qquad t = 1,2, \dots, T \tag{1}$$

In equation (1), y_{it} is the dependent variable, x_{it} is the independent variable, a_i is the time invariant variable and $u_{it}$is the error term. If we average equation 1 overtime, we get

$$\overline{y_i} = \beta_1(\overline{x_i}) + a_i + \overline{u_i} \tag{2}$$

Subtracting equation 2 form 1 we get:

$$y_{it} - \overline{y_i} = \beta_1(x_{it} - \overline{x_i}) + u_{it} - \overline{u_i} \tag{3}$$

In most cases dependent variables are themselves outcomes of choice processes and likely to be correlated with individual preferences and abilities captured by the time invariant variable (Wooldridge, 2012). In this case, RPM is an outcome of peoples' choice processes. During

different rounds of data collection, depending on the severity of the drought, people would experience stress which would impact their preferences lowering their RPM.

The survey was conducted over a period of one year, limiting the use of variables which remain constant over the three rounds. Thus, variables like age, illiteracy, ultra-poor and regular-poor have to be dropped. Furthermore, to control for heteroskedasticity we use heteroscedastic robust standard errors. The regression model using a Fixed Effects estimator is provide below:

$$RPM = \beta_0 + \beta_1 incomee + \beta_2 stress + \beta_3 stress_{veg} + \beta_4 fao + \epsilon$$

The above regression model shows pooled results for individuals who participated in at least two survey rounds. However, from the data we see that all individuals did not participate in the survey in all three rounds. In order to avoid biased results, only those individuals who participated in all three rounds of the survey.

CHAPTER SIX: RESULTS

Table 2 presents the results of the pooled OLS regression model. The parameter estimates for illiteracy, percentage of livestock died relative to current herd, and perception of past income are all negative and statistically significant at the 0.05 level. The coefficient for the dummy variable illiterate is -1.28, while coefficient for perception of income is -0.781. The effects of Normalized Difference Vegetation Index (NDVI) and Ultra Poor on RPM are positive. These variables are statistically significant at the 0.05 level. The coefficient for being ultra-poor, relative to the base of being non-poor, is 0.619. The goodness of fit of the model is measured by R^2. A ten percent of variation in RPM can be explained by explanatory variables. To check for constant variance, we observe that the p value is 0.0261 implying there is heteroskedasticity. In order to control for heteroskedasticity we use heteroscedastic robust standard errors. To test for multicollinearity, we look at the variance inflation factor which is 1.27 which shows there is no multicollinearity (multicollinearity exists if VIF >10) (Kutner et. al 2004). To check if the model does not have any omitted variables, we look Ramsey Reset test. Here the p value is 0.5297, hence we fail to reject null hypothesis implying the model does not have any omitted variables.

Table 2 OLS Regression Model

Dependent Variable = RPM			
Explanatory Variables	Coefficients	Standard Errors	t - Values
Age	-0.005	0.007	-0.70
Illiteracy	-1.280**	0.217	-5.90
Perception of Past Income	-0.781*	0.337	-2.32
Percentage of livestock died relative to current herd	-0.005**	0.001	-4.05
Normalized Difference Vegetation Index (NDVI)	0.025**	0.007	3.51
Standardized measure of livestock - FAO	-0.003	0.018	-0.15
Ultra Poor	0.619*	0.275	2.25
Regular Poor	0.402	0.296	1.36
Constant	3.995	1.073	3.72

R^2 = 0.097; Astrisks indicate coefficients with p-values less than 0.01(**) and 0.05(*)

Table 3 presents model estimates using a Fixed Effects estimator. The parameter estimates for perception of past income, percentage of livestock died relative to current herd are negative and statistically significant at the 0.05 level. The perception of past income coefficient is -1.022. The estimate for NDVI is positive with a value of 0.018. The signs of these variables are the same as those in Table 2.

Table 3 Fixed Effects Regression Model (pooled)

Dependent variable = Raven's Progressive Matrices Score (RPM)			
Explanatory Variables	Coefficients	Robust Standard Errors	t – values
Perception of Past Income	-1.022*	0.472	-2.16
Percentage of livestock died relative to current herd	-0.008**	0.002	-4.35
Normalized Difference Vegetation Index (NDVI)	0.018*	0.007	2.52
Standardized measure of livestock - FAO	-0.012	0.037	-0.34
Constant	4.798	0.980	4.9

Asterisks indicate coefficients with p-values less than 0.01(**) and 0.05(*). Standard Errors are heteroscedastic robust standard errors

Table 4 presents Fixed Effects results controlling for people who answered all survey rounds. The model used in Table 4 is the same as in Table 3. The parameter estimate for standardized measure of livestock - FAO is negative and statistically significant at the 0.05 level. The coefficient signs of the remaining variables are unchanged from Table 3 when the unbalanced sample is used. Perception of past income has a coefficient of -1.699.

Table 4 Results of Fixed effects regression model controlling for people who answered in all rounds

Dependent variable = Raven's Progressive Matrices Score (RPM)			
Explanatory Variables	Coefficients	Robust Standard Errors	t-values
Perception of Past Income	-1.699**	0.587	-2.90
Percentage of livestock died relative to current herd	-0.009**	0.002	-4.62
Normalized Difference Vegetation Index (NDVI)	0.025**	0.009	2.80
Standardized measure of livestock - FAO	-0.080*	0.030	-2.64
Constant	4.970	1.249	3.98

Asterisks indicate coefficients with p-values less than 0.01(**) and 0.05(*)

CHAPTER SEVEN: DISCUSSION

When assessing the association between levels of RPM and selected variables in Table 2 several dummy variables are important. Positive coefficients are estimated for ultra-poor and regular-poor. Compared to non-poor respondent, the RPM of ultra-poor is 0.55 units higher and that of regular poor is 0.34 units higher. The results for ultra-poor are significant but in case of regular poor they are insignificant. Illiteracy is another determinant which is highly significant. Illiteracy is negatively associated to RPM as we would expect. Formal schooling helps people get learning experiences which helps to develop RPM. According to Table 2, if a person is illiterate then his RPM is 1.28 units lower compared to a literate person.

Stress and NDVI, as measures of household stress, are also statistically associated to RPM. Stress is negatively related to RPM. The loss of every additional livestock reduces the RPM by -0.005 units. Whereas NDVI has a positive relationship which increases RPM by 0.03 units. In case of standardized livestock units (FAO), loss of every additional livestock lowers RPM by 0.002 units.

The variable incomee is consistently significant across Table 2 - 4, with a negative relationship to cognitive capacity. To correct the endogeneity in incomee a lagged incomee was used as an instrument variable. The association of lagged variable with the dependent variable becomes lesser as we go further in past (Wang and Bellemare 2019). Thus, lagged incomee is not a good instrument variable for incomee. It does satisfy the exclusion restriction cov(x,e)=0 but it does not satisfy the independence restriction cov(z,x) =/= 0. This happens because lagged incomee could be related to some unobserved confounder. Thus, lagged incomee is a poor IV.

Table 3 measures gives pooled results for changes in the scores of cognitions of people who participated in different rounds. Table 4 controls for sample of individuals who participated in all

three rounds. Incomee, stress and NDVI continue to be significant and have relationship with cognitive capacity similar to OLS regression. According to results from Table 4, if you expect your household financial well-being to be worse than your past months then cognitive capacity is expected to be lower by 81.7% (e^(-1.699023)-1) compared to the previous round. In case of stress, loss of every additional livestock relative to current herd lowers the RPM by (e^ (-0.0089)-1) 0.88% compared to previous rounds. NDVI continues to be positively significant with RPM. Stress negatively impacts RPM. From table 4 we see stress impacts RPM more significantly than incomee. Thus, stress is a better determinant of RPM than income.

CHAPTER EIGHT: CONCLUSION

Thus, there exists a negative association between incomee and cognitive capacity. We reject the null hypothesis. We do see a negative relationship as we expected. There is a decline in rainfall making drought conditions severe as we progress from round 1 to round 3. Main source of stress here is the loss of livestock due to drought. Drought leads to scarcity which increases stress. The impact of stress here is highly significant. As drought increases over the period of three rounds, stress also increases. Because of the scarcity that prevails in rounds 2 and 3 people perceive household financial well-being to be worse than their past expectations. People experience a loss in their perceptions. People care more about their losses than gains (loss aversion) which triggers stress and reduces cognitive capacity. Therefore, incomee is negatively associated with RPM.

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